wherein a size of a bubble generated on the heat generating element is changed by changing electric energy applied to the heat generating element to generate a bubble on both the first region and the second region or on only the second region, and wherein the volume of a liquid droplet discharged from the discharge port is changed.

REMARKS

Claims 1-5, 9-15, and 19-23 are presented for examination. Claims 1, 11, 22, and 23, the independent claims, have been amended to define still more clearly what Applicants regard as their invention, in terms which distinguish over the art of record.

Initially, a Claim To Priority and certified copies of the priority documents for this application were filed on November 22, 1999, as evidenced by the returned receipt postcard bearing the stamp of the Patent and Trademark Office, a copy of which is attached hereto. In their last Amendment, Applicants requested priority acknowledgment. Applicants now again respectfully renew their request for priority acknowledgment.

Claims 1, 2, 9, 21/1, and 22 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,339,762 to Shirato et al. Claims 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Shirato et al. ('762) in view of U.S. Patent No. 4,392,907 to Shirato et al.; Claim 10, as being unpatentable over Shirato et al. ('762) in view of U.S. Patent No. 4,429,321 to Matsumoto; Claims 11, 12, 21/11, and 23, as being unpatentable over Shirato et al. ('762) in view of European Patent Application No. EP-764,531 to Nakata et al.; Claims 13-15, as being unpatentable over Shirato et al. ('762) in view of Nakata et al., in view of Shirato et al. ('907); Claim 19, as being unpatentable over

Shirato et al. ('762) in view of Nakata et al., and U.S. Patent No. 5,658,471 (Murthy et al.); and Claim 20, as being unpatentable over Shirato et al. ('762) in view of Nakata et al. and Matsumoto.

Claim 1 is directed to a liquid discharge head comprising a heat generating element contacted with and between a pair of electrodes for generating thermal energy which is used for discharging liquid from a discharge port, and a protective coating provided on the heat generating element to protect the heat generating element. The protective coating has a first region with a substantially uniform thickness along a direction connecting the pair of electrodes and a second region with a substantially uniform thickness along that direction, wherein the second region is thinner than the first region stepwise. In addition, the volume of a liquid droplet discharged from the discharge port is changed by changing electric energy applied to the heat generating element.

One important feature of Claim 1 is that the protective coating has a first region with a substantially uniform thickness along a direction connecting the pair of electrodes and a second region which also has a substantially uniform thickness along that direction, and where the second region is thinner than the first region stepwise. This feature is described in the present specification on, for example, at page 8, lines 12-21, and is shown in at least Figs. 2A and 2B, where the first protective layer 108 corresponds to the recited first region, and the second protective layer 109 corresponds to the second region. By virtue of this feature, digital-like simple gradation recording can be obtained with high feasibility.

Shirato et al. ('762) relates to a liquid jet recording method. Fig. 4, cited by the Examiner, shows a cross-sectional view of a structure of an electrothermal transducer.

In Fig. 4, reference numerals 401-03 denote, respectively, a substrate, a heat accumulating layer, and a heat generating member. Each of these has a uniform thickness and is of a uniform material so as to make the heat supplying degree gradient between A4 and B4 continuous. Protective layer 406 has a thickness gradient from the side of electrode 404 to the side of electrode 405. Thus, there can be produced a positional distribution gradient of the heat quantity supplied to the liquid contacting the surface 407 from the heat surface 407 (a surface of the heat generating portion) per unit time.

Applicants submit that Fig. 4 of Shirato et al. ('762) does not teach or suggest the feature recited in Claim 1 discussed above, i.e., a protective coating having first and second regions, each having a substantially uniform thickness along a direction connecting the pair of electrodes, and with the second region being thinner than the first region stepwise.

Accordingly, Claim 1 is seen to be patentable over Shirato et al. ('762).

Independent Claims 11, 22, and 23 each contain features similar to those discussed above in connection with Claim 1, and are believed to be patentable for at least the same reasons as discussed above in connection with Claim 1. Applicants note, with respect to the rejections of Claims 11 and 23 set forth in paragraph 6 of the Office Action, that Nakata et al. is cited as showing an ink jet print head comprising a moving member (31) for the purpose of directing the propagation of the pressure wave toward the ejection outlet, and not for showing the features discussed above in connection with Claim 1. Accordingly, even if Nakata et al. is deemed to show all it is cited for, such does not supply what is missing from Shirata et al. ('762) as a reference against the independent claims herein.

A review of the other art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

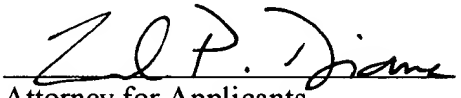
The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the reconsideration of the patentability of each on its own merits is respectfully requested.

This Amendment After Final Rejection is believed clearly to place this application in condition for allowance and its entry is therefore believed proper under 37 C.F.R. § 1.116. In any event, however, entry of this Amendment After Final Rejection, as an earnest effort to advance prosecution and reduce the number of issues, is respectfully requested. Should the Examiner believe that issues remain outstanding, he is respectfully requested to contact Applicants' undersigned attorney in an effort to resolve such issues and advance the case to issue.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



Attorney for Applicants

Registration No. 29,396

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200
#292964v1

VERSION MARKED TO SHOW CHANGES TO CLAIMS

1. (Twice Amended) A liquid discharge head comprising a heat generating element contacted with and between a pair of electrodes for generating thermal energy which is used for discharging liquid from a discharge port, and a protective coating provided on said heat generating element to protect said heat generating element,

wherein said protective coating has a first region with a substantially uniform thickness along a direction connecting said pair of electrodes and a second region with a substantially uniform thickness along the direction, wherein said second region is thinner than said first region stepwise, and wherein the volume of a liquid droplet discharged from said discharge port is changed by changing electric energy applied to said heat generating element.

11. (Twice Amended) A liquid discharge head comprising a heat generating element contacted with and between a pair of electrodes for generating thermal energy which is used for discharging liquid from a discharge port, a protective coating provided on said heat generating element to protect said heat generating element and a moving member provided facing said heat generating element and having a free end which is displaced in accordance with generation of a bubble due to said thermal energy,

wherein said protective coating has a first region with a substantially uniform thickness along a direction connecting said pair of electrodes and a second region with a substantially uniform thickness along the direction, wherein said second region is

thinner than said first region stepwise, and wherein the volume of a liquid droplet discharged from said discharge port is changed by changing electric energy applied to said heat generating element.

22. (Twice Amended) A liquid discharge method using a liquid discharge head having a heat generating element contacted with and between a pair of electrodes for generating thermal energy which is used for discharging liquid from a discharge port, and a protective coating for protecting the heat generating element, provided on the heat generating element, said protective coating having a first region with a substantially uniform thickness along a direction connecting the pair of electrodes and a second region with a substantially uniform thickness along the direction, wherein said second region is thinner than the first region stepwise,

wherein a size of a bubble generated on the heat generating element is changed by changing electric energy applied to the heat generating element to generate a bubble on both the first region and the second region or on only the second region, and wherein the volume of a liquid droplet discharged from the discharge port is changed.

23. (Twice Amended) A liquid discharge method using a liquid discharge head having a heat generating element contacted with and between a pair of electrodes for generating thermal energy which is used for discharging liquid from a discharge port, a protective coating for protecting the heat generating element, provided on the heat generating element and a moving member provided facing the heat generating

element and having a free end which is displaced in accordance with generation of a bubble due to the thermal energy, the protective coating having a first region with a substantially uniform thickness along a direction connecting the pair of electrodes and a second region with a substantially uniform thickness along the direction, wherein said second region is thinner than the first region stepwise,

wherein a size of a bubble generated on the heat generating element is changed by changing electric energy applied to the heat generating element to generate a bubble on both the first region and the second region or on only the second region, and wherein the volume of a liquid droplet discharged from the discharge port is changed.

#292641v1